

FIG. 1

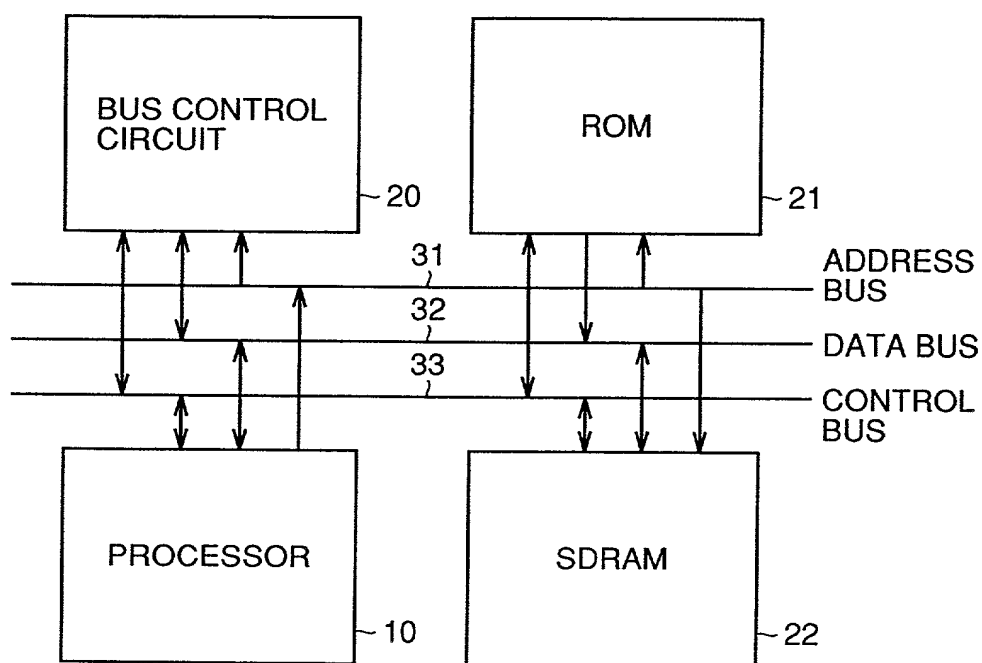
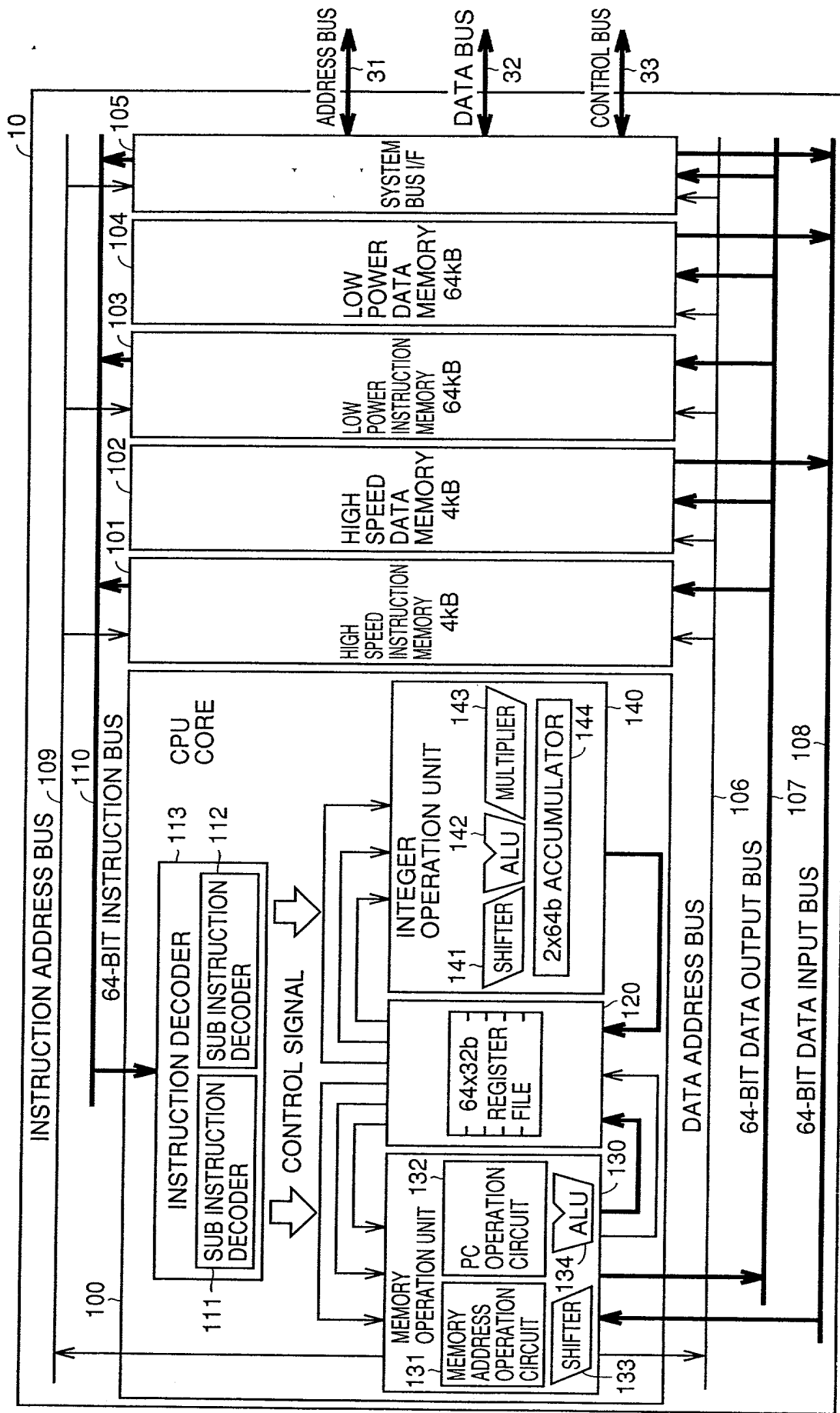
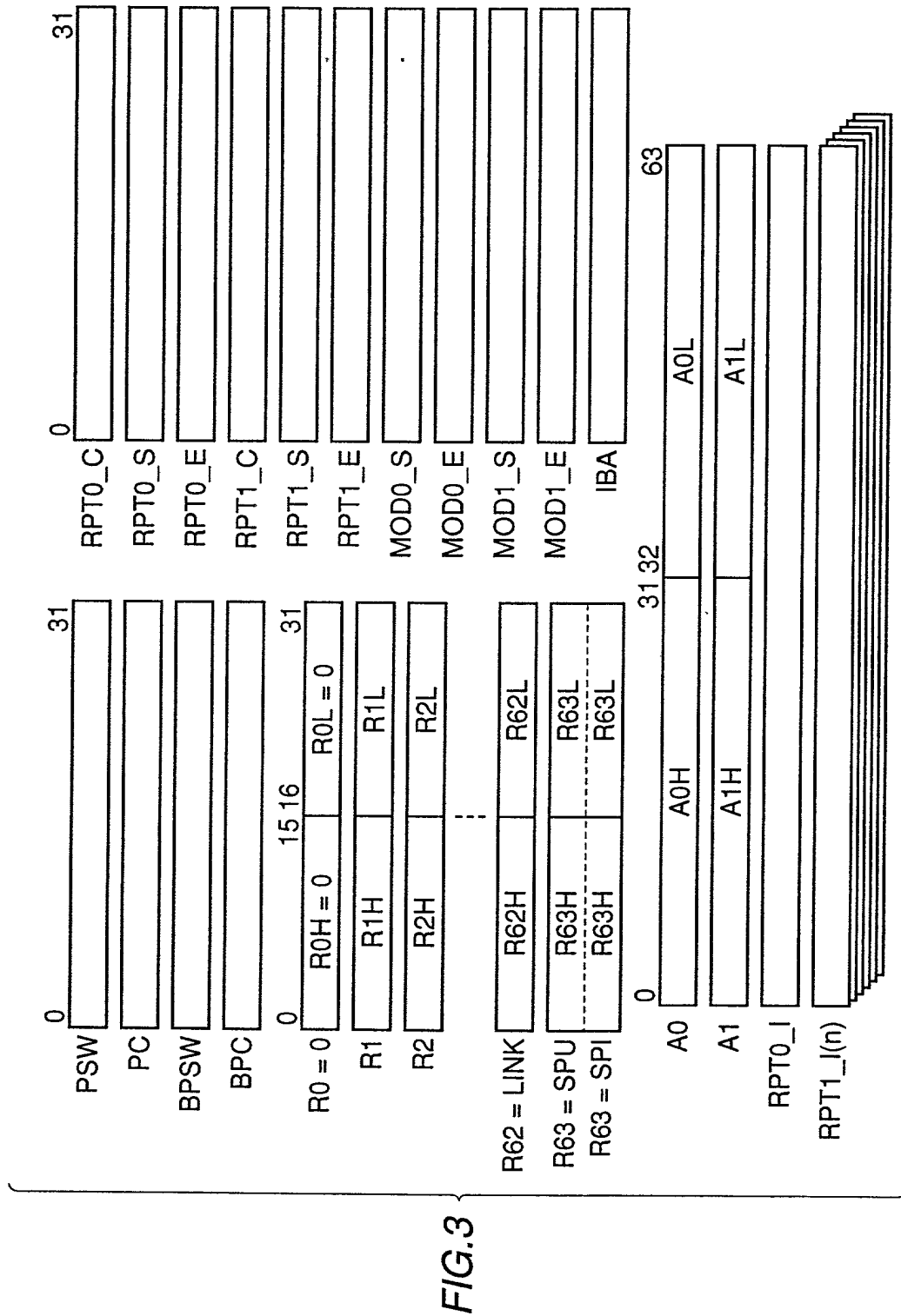


FIG.2





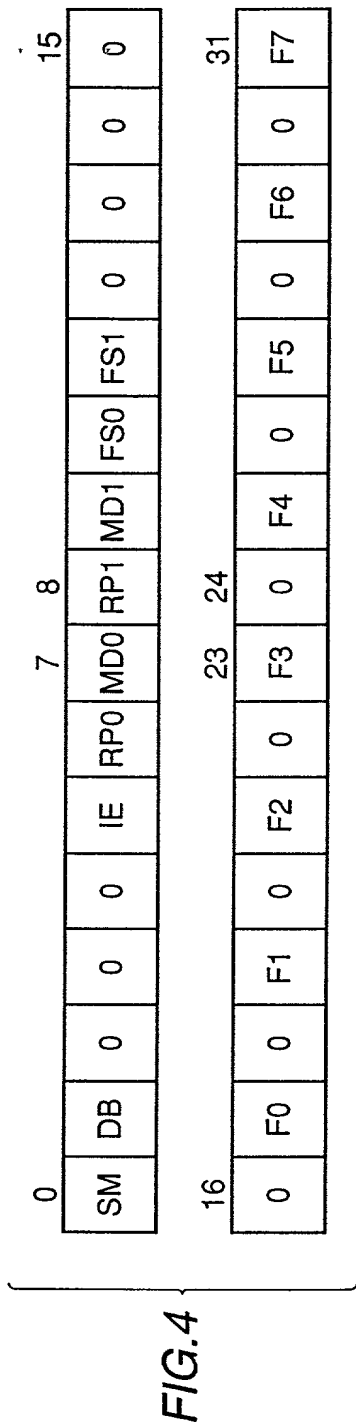
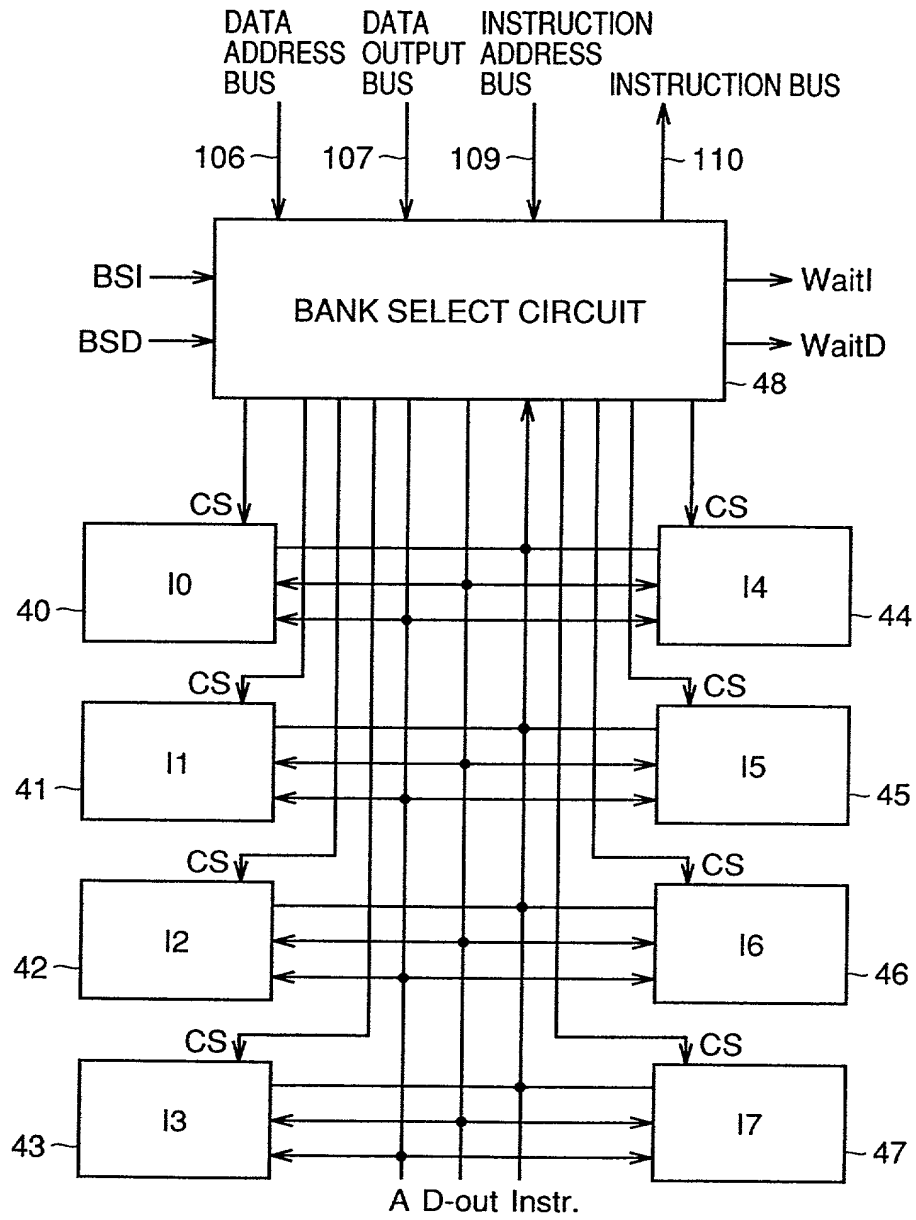


FIG.5



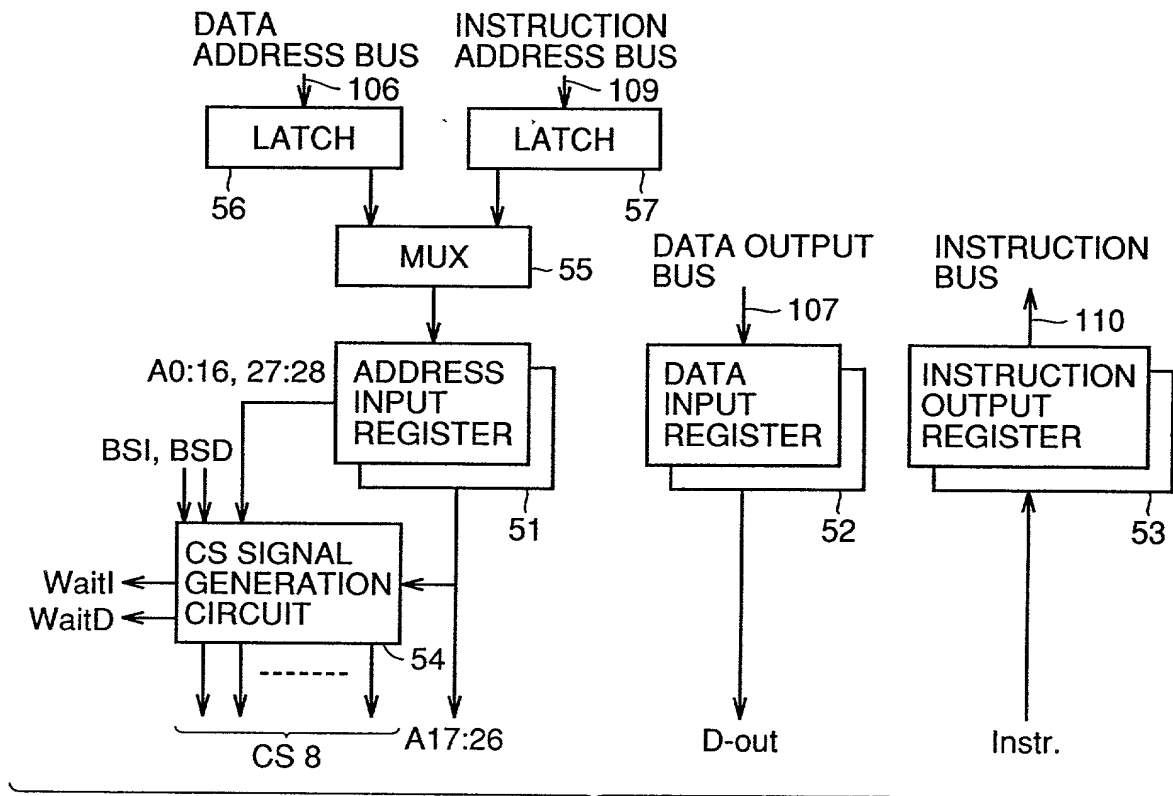


FIG. 6

FIG. 7

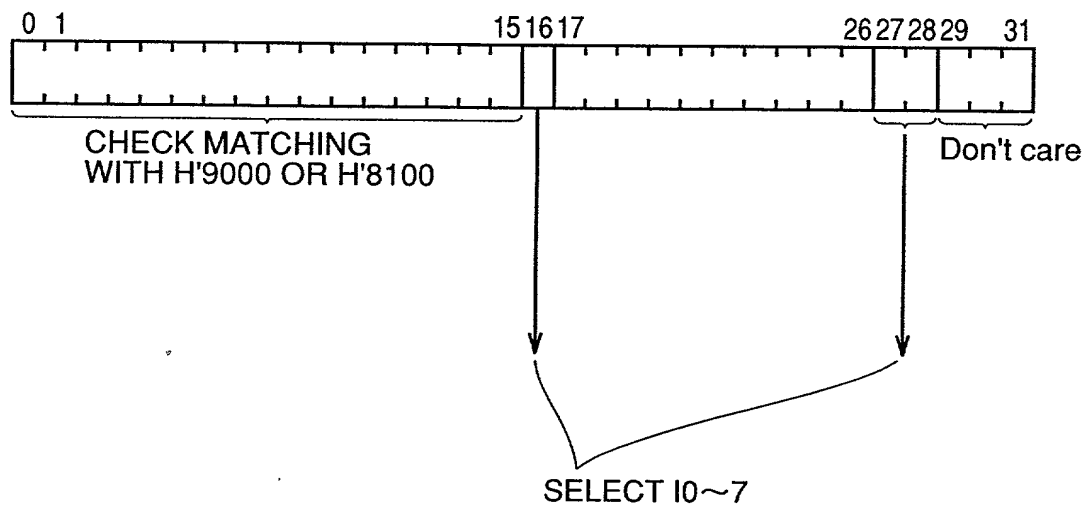


FIG.8

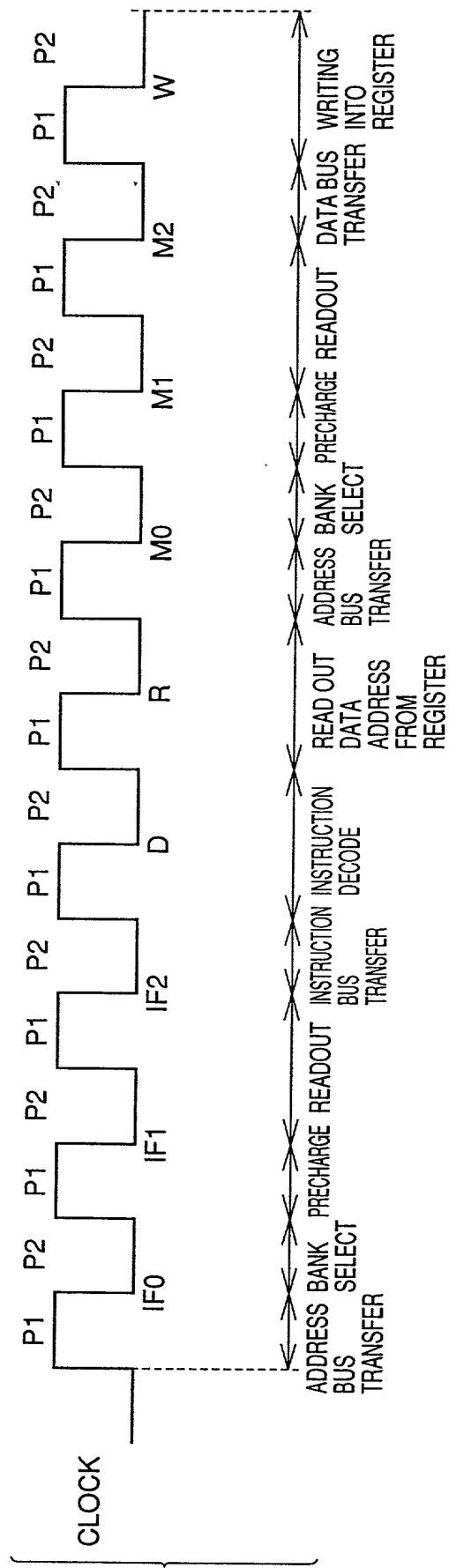
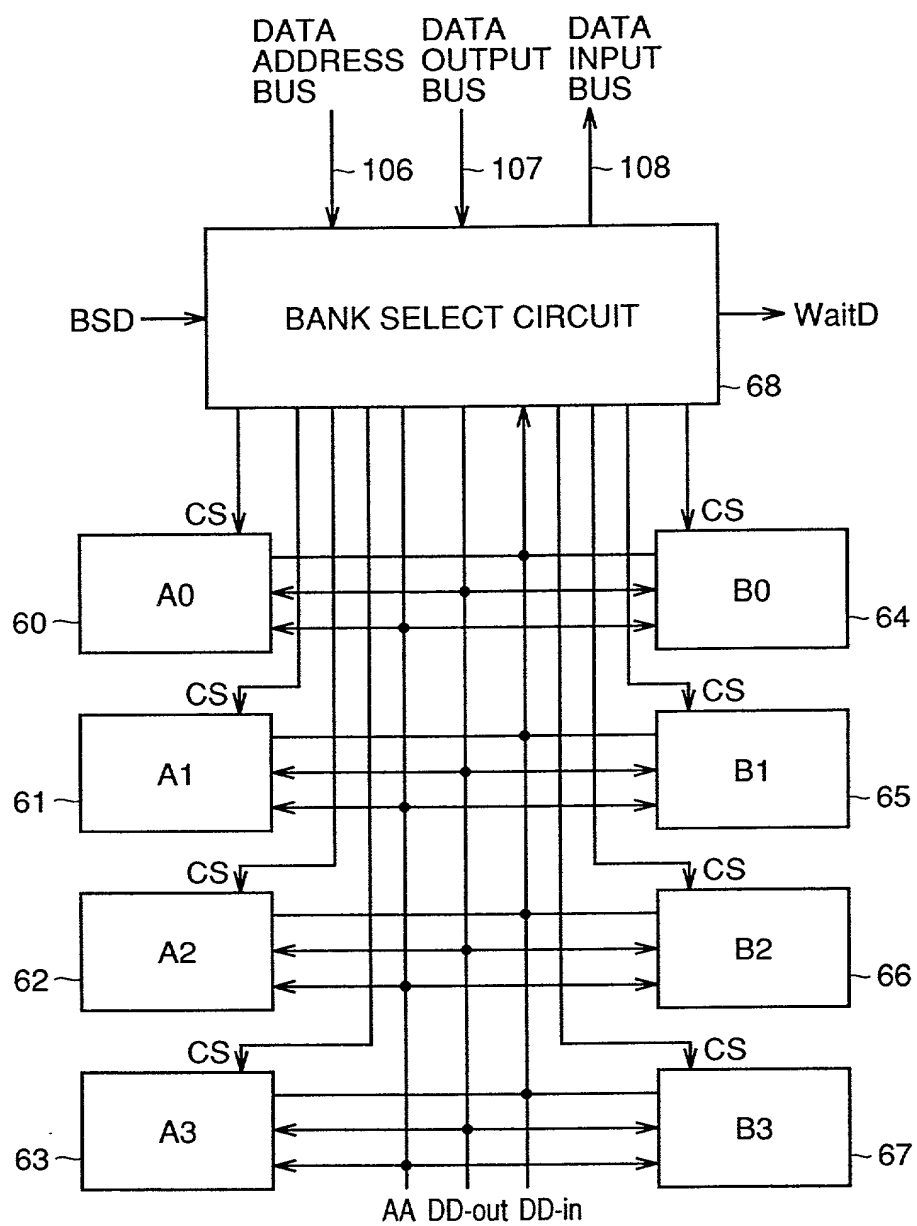


FIG.9





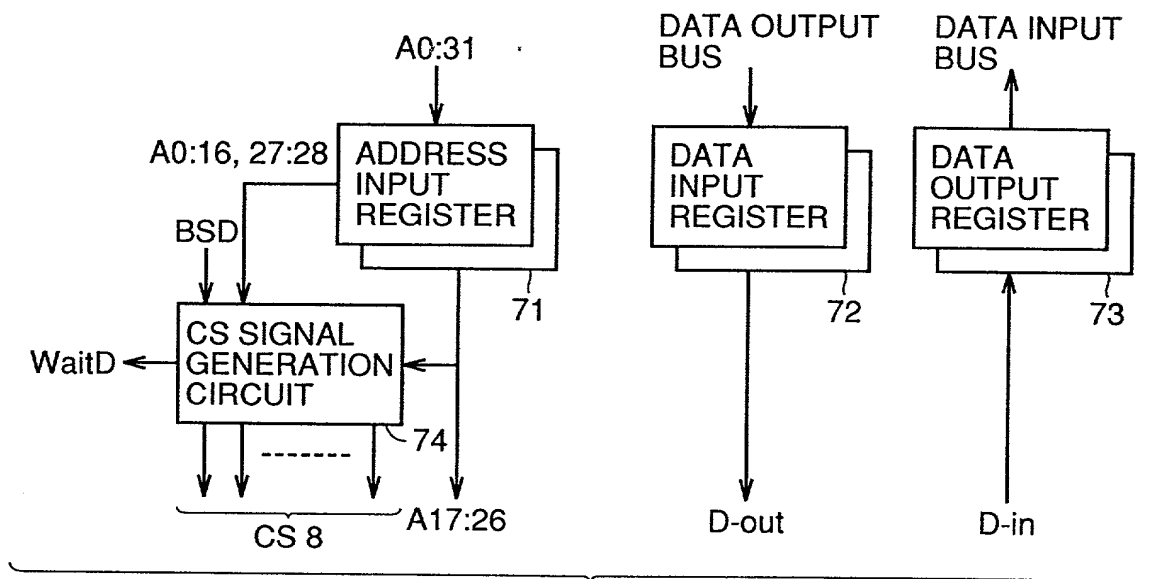


FIG. 10

FIG. 11

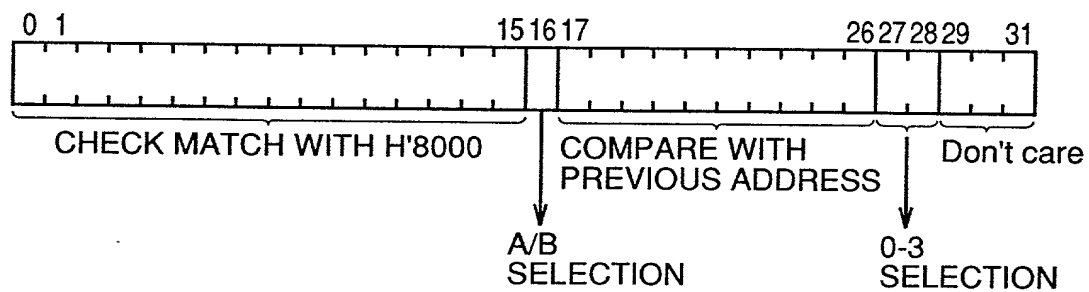


FIG.12A

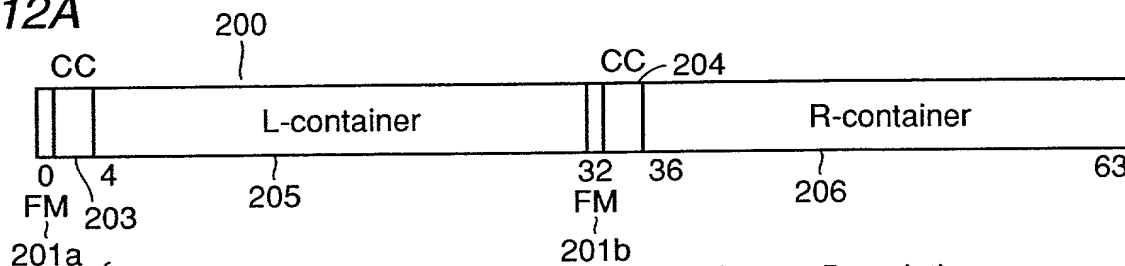


FIG.12B

Code	Conditions to be executed	Description
CC = 000	Always	---
CC = 001	F0 = T and F1 = don't care	/TX
CC = 010	F0 = F and F1 = don't care	/FX
CC = 011	F0 = don't care and F1 = T	/XT
CC = 100	F0 = don't care and F1 = F	/XF
CC = 101	F0 = T and F1 = T	/TT
CC = 110	F0 = T and F1 = F	/TF
CC = 111	Reserved	---

FIG.12C

FM	Number of sub-instructions	Issuing Order	
		L-container	R-container
00	two	1st	1st
01	two	1st	2nd
10	two	2nd	1st
11	one	1st	----

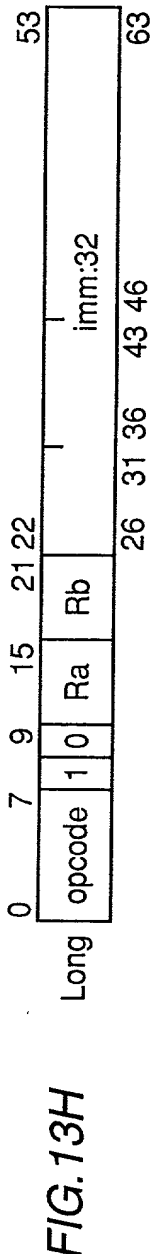
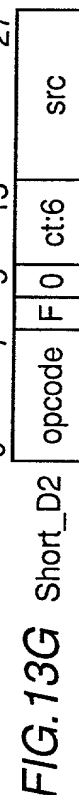
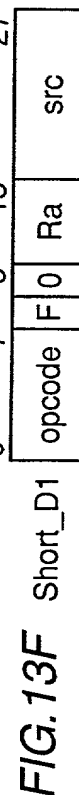
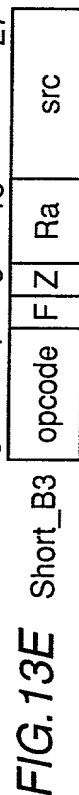
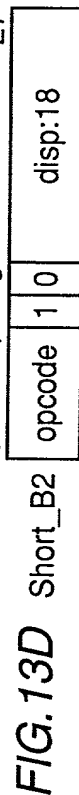
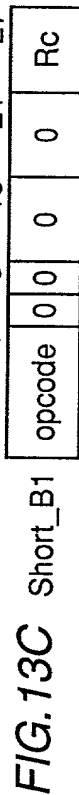
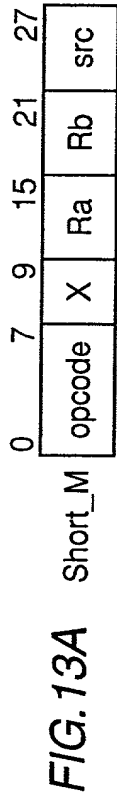


FIG.14A ALU

IF0	IF1	IF2	D	R	E0	W
-----	-----	-----	---	---	----	---

FIG.14B MAC

IF0	IF1	IF2	D	R	E0	E1
-----	-----	-----	---	---	----	----

FIG.14C LD/ST

IF0	IF1	IF2	D	R	M0	M1	M2	W
-----	-----	-----	---	---	----	----	----	---

FIG.14D BRA

IF0	IF1	IF2	D	R/A	W
-----	-----	-----	---	-----	---

FIG.14E ALU

IF0	IF1	D	R	E0	W
-----	-----	---	---	----	---

FIG.14F MAC

IF0	IF1	D	R	E0	E1
-----	-----	---	---	----	----

FIG.14G LD/ST

IF0	IF1	D	R	M0	M1	W
-----	-----	---	---	----	----	---

FIG.14H BRA

IF0	IF1	D	R/A	W
-----	-----	---	-----	---

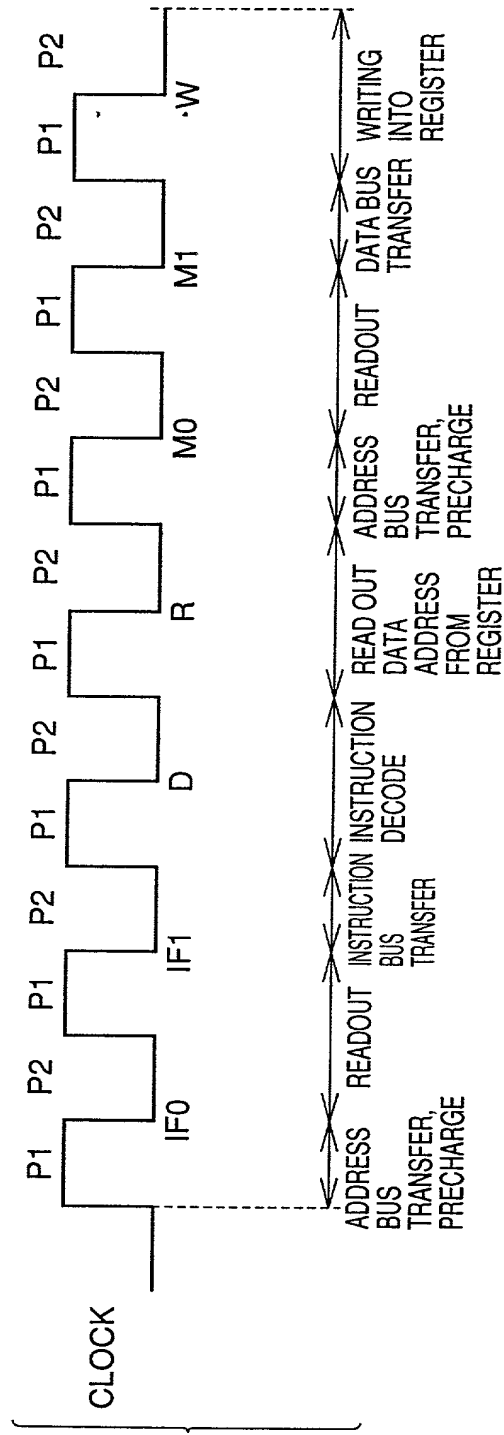


FIG. 15



**FIG.17**

• Arithmetic operation instructions

ABS	Absolute
ADD	Add
ADDC	Add with carry
ADDHppp	Add half-word
	ppp = LLL (000), LLH (001), LHL (010), LHH (011), HLL (100), HLH (101), HHL (110), HHH (111)
ADDS	Add register Rb with the sign of the third operand
ADDS2H	Add sign to two half-word
ADD2H	Add two pairs of half-words
AVG	Average with rounding towards positive infinity
AVG2H	Average two pairs of half-words rounding towards positive infinity
JOINpp	Join two half-words
	pp = LL (00), LH (01), HL (10), HH (11)
SUB	Subtract
SUBB	Subtract with borrow
SUBHppp	Subtract half-word
	ppp = LLL (000), LLH (001), LHL (010), LHH (011), HLL (100), HLH (101), HHL (110), HHH (111)
SUB2H	Subtract two pairs of half-words

• Logical operation instructions

AND	logical AND
OR	logical OR
NOT	logical NOT
XOR	logical exclusive OR
ANDFG	logical AND flags
ORFG	logical OR flags
NOTFG	logical NOT a flag
XORFG	logical exclusive OR flags

• Shift operation instructions

SRA	Shift right arithmetic	
SRAHp	Shift right arithmetic a half-word	p = L (0), H (1)
SRA2H	Shift right arithmetic two half-words	
SRC	Shift right concatenated registers	
SRL	Shift right logical	
SRLHp	Shift right logical a half-word	p = L (0), H (1)
SRL2H	Shift right logical two half-words	
ROT	Rotate right	
ROT2H	Rotate right two half-words	

• Bit operation instructions

BCLR	Clear a bit
BNOT	Invert a bit
BSET	Set a bit
BTST	Test a bit

FIG.18

• Branch instructions

BRA	Branch
BRATZR	Branch if zero
BRATNZ	Branch if not zero
BSR	Branch to subroutine
BSRTZR	Branch to subroutine if zero
BSRTNZ	Branch to subroutine if not zero
DBRA	Delayed Branch
DBRAI	Delayed Branch immediate
DBSR	Delayed Branch to subroutine
DBSRI	Delayed Branch immediate to subroutine
DJMP	Delayed Jump
DJMPI	Delayed Jump immediate
DJSR	Delayed Jump to subroutine
DJSRI	Delayed Jump immediate to subroutine
JMP	Jump
JMPTZR	Jump if zero
JMPTNZ	Jump if not zero
JSR	Jump to subroutine
JSRTZR	Jump to subroutine if zero
JSRTNZ	Jump to subroutine if not zero
NOP	No operation

• OS-related instructions

TRAP	Trap
REIT	Return from exception, interrupts, and traps

• DSP Arithmetic operation instructions

MUL	Multiply
MULX	Multiply with extended precision
MULXS	Multiply and shift to the left by one with extended precision
MULX2H	Multiply two pairs of half-words with extended precision
MULHXpp	Multiply two half-words with extended precision pp = LL (00), LH (01), HL (10), HH (11)
MUL2H	Multiply two pairs of half-words
MACd	Multiply and add (d = 0, 1)
MACSd	Multiply, shift to the left by one, and add (d = 0, 1)
MSUBd	Multiply and subtract (d = 0, 1)
MSUBSd	Multiply, shift to the left by one, and subtract (d = 0, 1)
SAT	Saturate
SATHH	Saturate word operand into high half-word
SATHL	Saturate word operand into low half-word
SATZ	Saturate into positive number
SATZ2H	Saturate two half-words into positive number
SAT2H	Saturate two half-word operands

• Repeat instructions

REPEAT0	Repeat a block of instructions #0
REPEAT1	Repeat a block of instructions #1

• Debugger supporting instructions

DBT	Debug trap
RTD	Return from debug interrupt and trap



FIG. 19

← 8 BYTES →	
H'0000 0000	NONE
H'2000 0000	ROM21
H'4000 0000	SDRAM22
H'7000 0000	OTHER PROCESSOR 10 EXTERNAL
H'7FFF FFF8	
H'8000 0000	LOW POWER DATA MEMORY 104
H'8100 0000	LOW POWER INSTRUCTION MEMORY 103
H'8200 0000	NONE
H'8400 0000	HIGH SPEED DATA MEMORY 102
H'8401 0000	NONE
H'8402 0000	HIGH SPEED INSTRUCTION MEMORY 101
H'8403 0000	MISCELLANEOUS

FIG.20

• Operation:

```

REPEAT1 #count, #pcaddr
    RPT1_C = #count-1
    RPT1_S = PC + 8
    RPT1_E = PC + pcaddr
    RPT1_I(0:5) = Instructions at memory((PC+8):(PC+48))
    if (PC == RPT1_E && RPT1_C > 0) {
        RPT1_C--
        PC == RPT1_S
    }

```

• Example:

```

REPEAT1 #20, #48
START:LD2W R10, @(R30+, R0) || MAC0 R0, R12, R22
      LD2W R20, @(R31+, R0) || MAC0 R0, R13, R23
      LD2W R12, @(R30+, R0) || MAC0 R0, R14, R24
      LD2W R22, @(R31+, R0) || MAC0 R0, R15, R25
      LD2W R14, @(R30+, R0) || MAC0 R0, R16, R26
END:LD2W R24, @(R31+, R0) || MAC0 R0, R17, R27

```

Zero-  
overhead  
loop

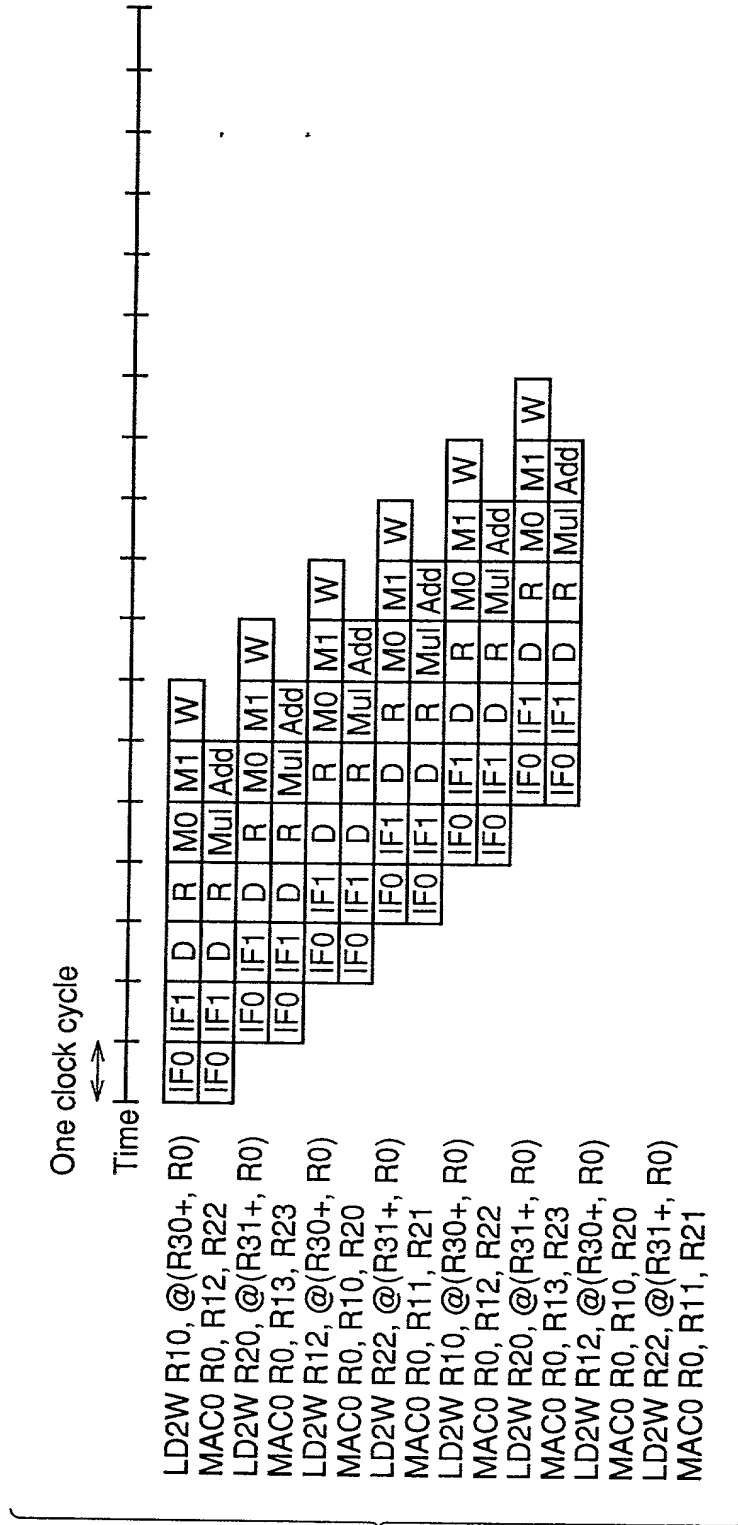


FIG.21

FIG.22

• Operation:

```
REPEAT0 #count, #pcaddr
RPT0_C = #count-1
RPT0_S = PC + 8
RPT0_E = PC + pcaddr
RPT0_I = Instruction at memory(PC+8)
if (PC == RPT0_E && RPT0_C > 0) {
    RPT0_C--
    PC == RPT0_S
}
```

• Example:

```
REPEAT0 #10, #64
START:LD2W R10, @(R30+, R0) || MAC0 R0, R12, R22
LD2W R20, @(R31+, R0) || MAC0 R0, R13, R23
LD2W R12, @(R30+, R0) || MAC0 R0, R14, R24
LD2W R22, @(R31+, R0) || MAC0 R0, R15, R25
LD2W R14, @(R30+, R0) || MAC0 R0, R16, R26
LD2W R24, @(R31+, R0) || MAC0 R0, R17, R27
LD2W R16, @(R30+, R0) || MAC0 R0, R10, R20
END:LD2W R26, @(R31+, R0) || MAC0 R0, R11, R21
```

Zero-  
overhead  
loop

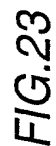
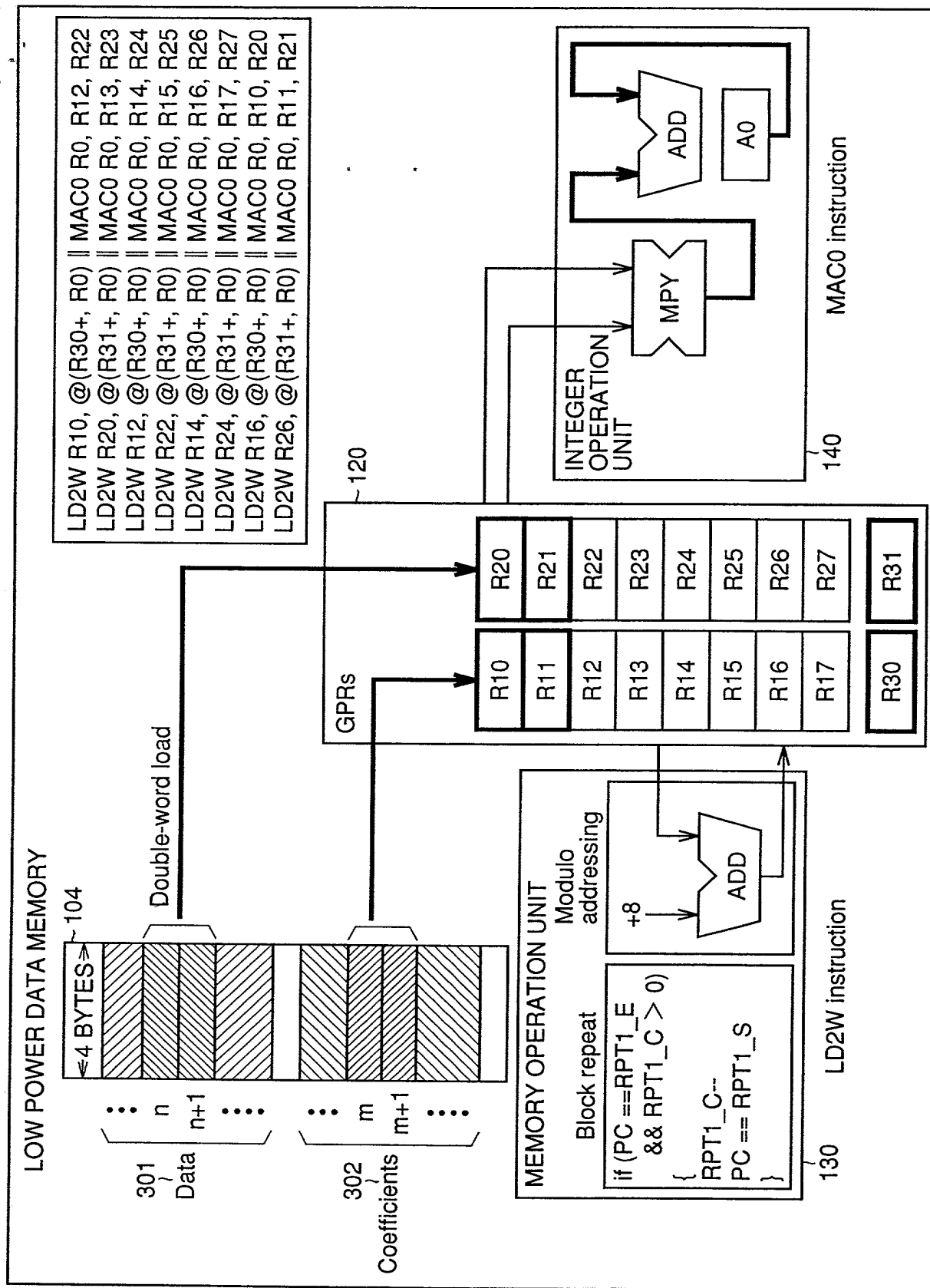


FIG.24



LD2W R10, @(R30+, R0) || MAC0 R0, R12, R22  
 LD2W R20, @(R31+, R0) || MAC0 R0, R13, R23  
 LD2W R12, @(R30+, R0) || MAC0 R0, R14, R24  
 LD2W R22, @(R31+, R0) || MAC0 R0, R15, R25  
 LD2W R14, @(R30+, R0) || MAC0 R0, R16, R26  
 LD2W R24, @(R31+, R0) || MAC0 R0, R17, R27  
 LD2W R16, @(R30+, R0) || MAC0 R0, R10, R20  
 LD2W R26, @(R31+, R0) || MAC0 R0, R11, R21